MATH 110 PRACTICE QUESTIONS for Exam 3 on Thursday, March 30, 2006

Covering: Sections 3.2 – 3.6, 4.1 – 4.3

1. (3.2 see #25) Find the domain of the function $f(x) = \dfrac{x+1}{x-1}$.

   (a) All real numbers except $x = -1$.
   (b) All real numbers except $x = 1$ and $x = -1$.
   (c) All real numbers except $x = 1$.
   (d) All real numbers.
   (e) None of these.

2. (3.2) Find the domain of the function f defined by $f(x) = \dfrac{x}{x^2 - 9}$.

   (a) All real numbers
   (b) All real numbers except 0
   (c) All real numbers except -3 and 3
   (d) All real numbers except 9
   (e) None of these

3. (3.2) What is the domain of the function f defined by $f(x) = \sqrt{4 - 3x}$?

   (a) $(-\infty, 0]$
   (b) $(-\infty, 0)$
   (c) $[4/3, \infty)$
   (d) $(-\infty, 4/3]$
   (e) $(-\infty, 4/3)$

4. (3.3 #57) The function $f(x) = \dfrac{-x^3}{3x^2 - 9}$ is

   (a) Odd
   (b) Even
   (c) Neither odd nor even
   (d) Both odd and even
   (e) None of these

5. (3.3 #44) For the function $f(x) = \dfrac{1}{x^2}$, the equation of the secant line joining $(1, f(1))$ and $(2, f(2))$ is:

   (a) $y = -\frac{3}{4}x + \frac{7}{4}$
   (b) $y = -\frac{3}{4}x - \frac{7}{4}$
   (c) $y = \frac{3}{4}x + \frac{1}{4}$
   (d) $y = \frac{3}{4}x - \frac{5}{4}$
   (e) None of these

6. (3.3) If f is an odd function and (a, b) lies on the graph of f, what other point(s) must also lie on the graph of f?

   (a) $(-a, b)$
   (b) $(a, -b)$
   (c) $(-a, -b)$
   (d) $(a, -b)$ and $(-a, b)$
   (e) $(a, -b)$ and $(-a, -b)$

7. (3.4 see #38) Find the x-intercept(s) and the y-intercept of the function

$$f(x) = \begin{cases} 3 + x & \text{if } -3 \le x < 0 \\ 2 & \text{if } x = 0 \\ \sqrt{x} - 1 & \text{if } 0 < x \end{cases}$$

   (a) $x = -3$ and $y = 2$
   (b) $x = -3$ and $y = 3$
   (c) $x = 3$ and $y = 2$
   (d) $x = 3$ and $y = 3$
   (e) None of these

8. (3.4) If $f(x) = \begin{cases} x^2 & \text{if } x < 0 \\ 2 & \text{if } x = 0 \\ 2x+1 & \text{if } 0 < x \end{cases}$,

find $f(x+3)$ when $x > 0$.

(a) $x^2 + 6x + 9$

(b) $x^2 + 6x + 10$

(c) $2x + 6$

(d) $2x + 7$

(e) None of these

9. (3.5 p272 see #l9–26) Using the function $f(x) = x^3$, find the equation of the corresponding function whose graph is shifted left 1 unit, reflected about the x-axis, and shifted up 2 units.

(a) $f(x) = -(x+2)^3 + 1$

(b) $f(x) = -(x-2)^3 + 1$

(c) $f(x) = -(x+1)^3 + 2$

(d) $f(x) = -(x-1)^3 + 2$

(e) None of these

10. (3.5 p272 see #21,24) Using the function $f(x) = x^3$, find the equation of the corresponding function whose graph is reflected about the x-axis and then shifted down 4 units.

(a) $f(x) = -(x-4)^3$

(b) $f(x) = -(x+4)^3$

(c) $f(x) = -x^3 - 4$

(d) $f(x) = -x^3 + 4$

(e) None of these

11. (3.5 p270 see Example 12) Which one of the functions listed below has the given graph?

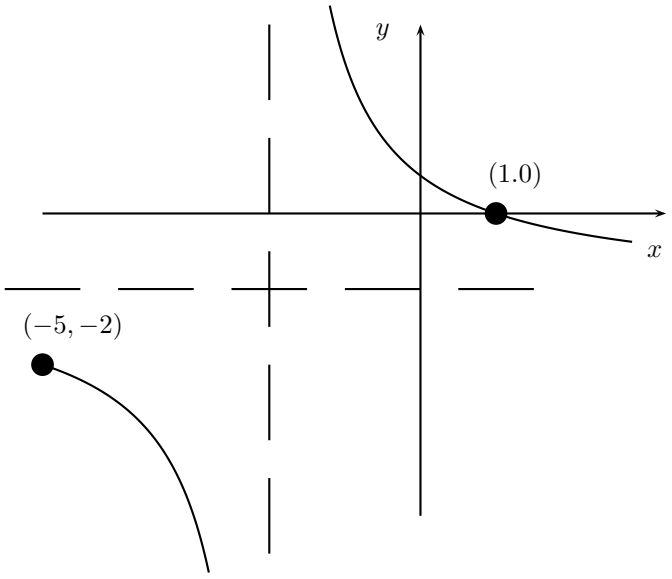
(a) $f(x) = \dfrac{3}{x+2} - 1$

(b) $f(x) = \dfrac{3}{x+2} + 1$

(c) $f(x) = \dfrac{3}{x-2} + 1$

(d) $f(x) = \dfrac{3}{x-2} + 3$

(e) None of these



12. (3.5) If the graph of $y = 3x^2 + 4x - 5$ is reflected about the y-axis, the new equation is

(a) $y = -3x^2 - 4x + 5$

(b) $y = -3x^2 + 4x + 5$

(c) $y = 3x^2 - 4x + 5$

(d) $y = 3x^2 - 4x - 5$

(e) None of these

13. (3.6 p281 #15) A rectangle has one corner on the graph of $y = 16 - x^2$, another at the origin, a third on the positive y-axis, and the fourth on the positive x-axis. Express the area as a function of x.

(a) $A(x) = -x^2 + x + 16$
(b) $A(x) = -x^3 + 16x$
(c) $A(x) = -x^3 + 8x$
(d) $A(x) = -x^2 + 16$
(e) None of these

14. (3.6 p280 see #8) Alex has 400 feet of fencing to enclose a rectangular garden. One side of the garden lies along the barn, so only three sides require fencing. Express the area $A(x)$ of the rectangle as a function of x, where x is the length of the side perpendicular to the side of the barn.

(a) $A(x) = -x^2 + 200x$
(b) $A(x) = -x^2 + 400x$
(c) $A(x) = -2x^2 + 200x$
(d) $A(x) = -2x^2 + 400x$
(e) None of these

15. (3.6 p281 #22) A wire of length x is bent into the shape of a square. Express the area $A(x)$ as a function of x.

(a) $A(x) = x^2$
(b) $A(x) = \dfrac{x^2}{4}$
(c) $A(x) = \dfrac{x^2}{16}$
(d) $A(x) = \dfrac{x^2}{4\pi}$
(e) None of these

16. (4.1 p299) If $f(x)$ is a quadratic function whose graph has the vertex (h, k), which one is the correct form of the function?

(a) $f(x) = a(x - h) + k$
(b) $f(x) = a(x - h)^2 + k$
(c) $f(x) = a(x - k)^2 + h$
(d) $f(x) = \sqrt{r^2 - (x - h)^2} + k$
(e) $f(x) = a(x - k)^3 + h$

17. (4.1 p307 #42) If $f(x) = x^2 - 2x - 3$, then the vertex of the graph of $f(x)$ is

(a) (-2,5)
(b) (-1,0)
(c) (1,-4)
(d) $(2, -3)$
(e) None of these

18. (4.1 p307) Find the vertex of the quadratic function $f(x) = 2x^2 - 4x + 9$.

(a) $(0, 9)$
(b) $(-1, 7)$
(c) $(1, 7)$
(d) $(1, 1)$
(e) None of (a), (b), (c), or (d).

19. (4.1 p307 see #51) Let $f(x) = 4x^2 - 8x + 3$. Find the axis of symmetry of the graph of $f(x)$.

(a) $x = 2$
(b) $x = -2$
(c) $x = 1$
(d) $x = -1$
(e) None of these

20. (4.1 p307 see #51) Let $f(x) = 4x^2 - 8x + 3$. Find the x and y-intercepts, if any.

(a) $(-\frac{3}{2}, 0)$ $(-\frac{1}{2}, 0)$ $(0, 3)$
(b) $(\frac{3}{2}, 0)$ $(\frac{1}{2}, 0)$ $(0, 3)$
(c) $(-1, 0)$ $(0, 3)$
(d) $(15, 0)$ $(0, 3)$
(e) None of these

21. (4.1 p308 #62) Find the minimum value of the quadratic function $f(x) = 4x^2 - 8x + 3$.

(a) -5
(b) -1
(c) 3
(d) 15
(e) 35

22. (4.1 p307 #55) Find the equation of the quadratic function whose graph has vertex $(-3, 5)$ and y-intercept -4.

(a) $f(x) = -(x-3)^2 + 5$
(b) $f(x) = (x-3)^2 - 13$
(c) $f(x) = -(x+3)^2 + 5$
(d) $f(x) = (x+3)^2 + 5$
(e) None of these

23. (4.1 p308 see #61) Find the minimum value of the function $f(x) = 2x^2 + 12x + 6$.

(a) -48
(b) -20
(c) -12
(d) 60
(e) None of these

24. (4.1 p308 see #61) For $f(x) = 2x^2 - 12x + 14$, determine whether $f(x)$ has a maximum or a minimum value and find that value.

(a) max $= -3$
(b) max $= 4$
(c) min $= -4$
(d) min $= 3$
(e) None of these

25. (4.1 p308 see #69) A store selling calculators has found that, when the calculators are sold at a price of p dollars per unit, the revenue R (in dollars) as a function of the price p is $R(p) = -750p^2 + 15000p$. What is the largest possible revenue? That is, find the maximum value of the revenue function.

(a) \$10
(b) \$100
(c) \$60,000
(d) \$75,000
(e) None of these

26. (4.1 p309 see #78) A farmer with 200 feet of fencing wants to enclose a rectangular plot that borders on a straight highway. If the farmer does not fence the side along the highway, what is the largest area that can be enclosed?

(a) 50 square feet
(b) 100 square feet
(c) 500 square feet
(d) $5,000$ square feet
(e) None of these

27. (4.1 p308 #69) Suppose that the manufacturer of a gas clothes dryer has found that when the unit price is p dollars the revenue R (in dollars) is $R(p) = -4p^2 + 4000p$. What is the largest possible revenue? That is, find the maximum value of the revenue function.

(a) \$4000
(b) \$1,000,000
(c) \$500
(d) \$3,000,000
(e) None of these

28. (4.1 p308 see #73) The price p and the quantity x sold (of a certain product) obey the demand equation $x = -5p + 300, \quad 0 \le p \le 60.$ Express the revenue $R(x)$ as a function of x.

(a) $R(x) = -\frac{1}{5}x^2 + 60x$

(b) $R(x) = -\frac{1}{5}x^2 + 300x$

(c) $R(x) = -\frac{1}{5}x^2 - 60x$

(d) $R(x) = -\frac{1}{5}x^2 - 300x$

(e) None of these

29. (4.1 p308 see #73) As in the previous problem, the price p and the quantity x sold obey the demand equation $x = -5p + 300, \quad 0 \le p \le 60.$ What price should the company charge to maximize revenue?

(a) $p = 10$

(b) $p = 20$

(c) $p = 40$

(d) $p = 100$

(e) None of these

30. (4.2 p327 #38) Form a polynomial function of degree 3 with zeros -2, 2, 3.

(a) $f(x) = (x^2 - 4)(x - 3)^2$

(b) $f(x) = (x^2 - 4)(x + 3)^2$

(c) $f(x) = (x^2 - 4)(x - 3)$

(d) $f(x) = (x^2 - 4)(x + 3)$

(e) None of these

31. (4.2 see p322) The polynomial function $f(x)$ has a zero at $x = 2$ with multiplicity 3. We know

(a) Since 3 is an odd number, the graph touches but does not cross the x-axis.

(b) Since 3 is an odd number, the graph crosses the x-axis.

(c) Since 2 is an even number, the graph touches but does not cross the x-axis.

(d) Since 2 is an even number, the graph crosses the x-axis.

(e) None of these

32. (4.2 p328 see #84) Which one of these functions might have the given graph?

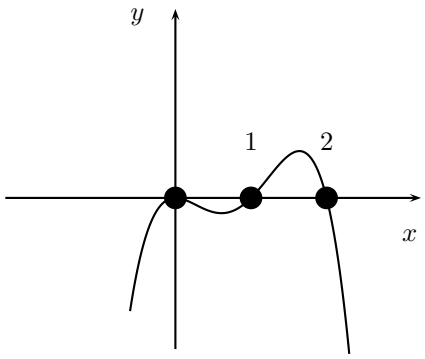
(a) $f(x) = x(x - 1)(x - 2)^2$

(b) $f(x) = -x(x - 1)(x - 2)$

(c) $f(x) = x(x - 1)(x - 2)$

(d) $f(x) = x^2(x - 1)(x - 2)$

(e) $f(x) = -x^2(x - 1)(x - 2)$



33. (4.2 p327 see #45) Find all the zeros and their multiplicities for the polynomial $p(x) = 11x(x - 1)^5(x + 6)$.

(a) -1 is a zero of multiplicity 5; 6 is a zero of multiplicity 1; 0 is a zero of multiplicity 1

(b) 1 is a zero of multiplicity 5; -6 is a zero of multiplicity 1; 0 is a zero of multiplicity 1

(c) -1 is a zero of multiplicity 5 and 6 is a zero of multiplicity 1

(d) 1 is a zero of multiplicity 5; -6 is a zero of multiplicity 1.

(e) None of these

34. (4.2 p328 see #77) The function $f(x) = x^2(x-2)(x+3)^2$ has

(a) One zero of multiplicity 1 and one zero of multiplicity 2
(b) One zero of multiplicity 1 and two zeros of multiplicity 2
(c) One zero of multiplicity 1 and three zeros of multiplicity 2
(d) Three zeros of multiplicity 1 and one zero of multiplicity 2
(e) None of these

35. (4.3 p339) Find the domain of the function $f(x) = \dfrac{x-2}{x+1}$.

(a) All real numbers except -1
(b) All real numbers except 1
(c) All real numbers except -2
(d) All real numbers except 2
(e) None of these

36. (4.3 p339 see #13) What is the domain of the function G defined by $G(x) = \dfrac{x+4}{x^3-4x}$?

(a) all reals except -4
(b) all reals except $2, -2$
(c) all reals except $0, 2, -2$
(d) $\{0, 2, -2\}$
(e) $\{0, 2, -2, -4\}$

37. (4.3 p339 see #31) The graph of $y = \dfrac{1}{(x-4)^2}$ looks like that of $y = \dfrac{1}{x^2}$ but is shifted

(a) left 4 units
(b) right 4 units
(c) down 4 units
(d) up 4 units
(e) None of these

38. (4.3) Find the vertical asymptotes of the graph of $f(x) = \dfrac{x^2-3x}{x^2-2x-8}$.

(a) $x = -4$ and $x = 2$
(b) $x = 4$ and $x = -2$
(c) $x = 0$ and $x = 3$
(d) $x = 4$, $x = -2$, $x = 0$ and $x = 3$
(e) None of these

39. (4.3) Find the horizontal asymptote of the graph of $f(x) = \dfrac{x-3}{5x+2}$.

(a) $y = -\frac{3}{2}$
(b) $y = \frac{1}{5}$
(c) $x = -\frac{2}{5}$
(d) $x = -\frac{1}{3}$
(e) None of these

40. (4.3) The line $x = 4$ is a vertical asymptote of the graph of which of the following functions? [There is only one correct answer!]

(a) $f(x) = \dfrac{2x-8}{x-4}$
(b) $f(x) = \dfrac{1}{x^2-16}$
(c) $f(x) = \dfrac{x-4}{x+3}$
(d) $f(x) = \dfrac{4x+1}{x+2}$
(e) $f(x) = x - 4$

41. (4.3) Find the x-intercepts and vertical asymptotes of the graph of $f(x) = \dfrac{x^2 - 3x}{x^2 - 2x - 8}$

(a) x-intercepts $(4,0), (3,0), (-2,0), (0,0)$
vertical asymptotes $x = 4, x = 3, x = -2, x = 0$

(b) x-intercepts $(-4,0), (2,0)$
vertical asymptotes $x = 0, x = 3$

(c) x-intercepts $(4,0), (-2,0)$
vertical asymptotes $x = 0, x = 3$

(d) x-intercepts $(0,0), (3,0)$
vertical asymptotes $x = 4, x = -2$

(e) x-intercepts $(0,0), (3,0)$
vertical asymptotes $x = -4, x = 2$

42. (4.3 see #43) Find the vertical asymptotes of $f(x) = \dfrac{(x-1)(x+2)(x-3)}{x(x-4)^2}$.

(a) $x = 1, -2, 3$

(b) $x = 0, 1, -2, 3, 4$

(c) $x = 0, 4$

(d) $x = 4$

(e) None of these

43. (4.3 #48) Find the horizontal asymptote (if any) of $f(x) = \dfrac{-2x^2 + 1}{2x^3 + 4x^2}$.

(a) $y = -2$

(b) $y = -1$

(c) $y = 1$

(d) $y = 0$

(e) None of these

44. (4.3) Find the horizontal asymptote for the graph of $f(x) = \dfrac{5x - 1}{2x + 3}$.

(a) $x = -\frac{3}{2}$

(b) $x = \frac{5}{2}$

(c) $y = -\frac{3}{2}$

(d) $y = \frac{5}{2}$

(e) None of these

45. (4.3) Which one of these functions does **not** have a horizontal asymptote?

(a) $f(x) = \dfrac{2}{3x - 5}$

(b) $f(x) = \dfrac{2x^2 + 1}{3x - 5}$

(c) $f(x) = \dfrac{2x^2 + 1}{3x^2 - 5}$

(d) $f(x) = \dfrac{2x}{3x^2 - 5}$

(e) $f(x) = 2 + \dfrac{6}{3x^2 - 5}$

46. (4.3 #27) Find the asymptotes of the following function. $f(x) = \dfrac{3x^2 - 3x}{x^2 + x - 12}$

(a) The horizontal asymptote is $y = 0$; the vertical asymptotes are $x = -4$ and $x = 3$.

(b) The horizontal asymptote is $y = 3$; the vertical asymptotes are $x = 4$ and $x = -3$.

(c) The horizontal asymptote is $y = 3$; the vertical asymptotes are $x = -4$ and $x = 3$.

(d) The horizontal asymptote is $y = -4$; the vertical asymptote is $x = 3$.

(e) None of these